

## CLAIMS

We claim:

1. A fluid dispensing assembly for dispensing a selected fluid into multiple vessels, the fluid dispensing assembly being connectable to a fluid source, comprising:

a distribution manifold having a manifold inlet positioned to receive fluid from the fluid source, the distribution manifold having a plurality of distribution channels coupled to the manifold inlet, the distribution channels each having a separate channel outlet, each distribution channel having a first valve therein to allow the fluid to flow in only one direction in the respective distribution channel; and

an array of fluid dispensers connected to the distribution manifold, each fluid dispenser being connected to the channel outlet of a respective distribution channel to receive the fluid passing through the channel outlet, each fluid dispenser having a second valve therein to allow the fluid to flow in only one direction out of the respective fluid dispenser.

2. The fluid dispensing assembly of claim 1 further comprising a gate valve connected to the distribution manifold and positioned to control fluid flow from the fluid source to the distribution manifold.

3. The fluid dispensing assembly of claim 1 having a plurality of fluid sources with fluids therein, the assembly further comprising a selector valve connectable to the plurality of fluid sources, the selector valve being adjustable to one of a plurality of positions to allow a selected one of the fluids to pass therethrough to the distribution manifold.

4. The fluid dispensing assembly of claim 3 wherein the selector valve includes a body with a plurality of fluid inlets connectable fluid lines from the fluid sources, a plurality of fluid passageways in the body communicating with the fluid inlets, a valve member connected to the body, and an outlet channel communicating with the valve member and the manifold inlet, the valve member having a valve channel therethrough that communicates with the outlet passageway, the valve member being adjustable to position the valve channel in

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communication with one of the fluid passageways to direct fluid from the one of the fluid passageways into the outlet passageway and into the manifold inlet and the valve member blocks the other fluid passageways to prevent fluid from flowing therethrough.

5. The fluid dispensing assembly of claim 4 wherein the selector valve assembly has a gate valve in the outlet passageway, the gate valve being adjustable between open and closed positions to control the flow of fluid through the outlet passageway.

6. The fluid dispensing assembly of claim 4 wherein the valve member is a rotary valve member that rotationally adjustable to separately align the valve channel with each of the fluid passageways.

7. The fluid dispensing assembly of claim 4 wherein the selector valve includes a valve control assembly connected to the valve member and being adjustable to move the valve member to align the valve channel with the selected one of the fluid passageways.

8. The fluid dispensing assembly of claim 7, further comprising a programmable controller connected to the valve control assembly for controlling adjustment of the valve member relative to the fluid passageways.

9. The fluid dispensing assembly of claim 4, further comprising a programmable controller and the selector valve having a control device operatively connected to the controller for automatic adjustment of the valve member relative to the fluid passageways.

10. The fluid dispensing assembly of claim 1 wherein the fluid dispensers are syringes.

11. The fluid dispensing assembly of claim 1 wherein the array of fluid dispensers include 96 syringes.

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12. The fluid dispensing assembly of claim 1 further comprising distributor members connected to the fluid dispensers, the distributor members having an interior passageway, a distal end portion, and a radially directed aperture in the distal end portion, the aperture communicating with the interior passageway to direct a flow of fluid radially away from the distal end portion.

13. The fluid dispensing assembly of claim 1, further including a frame, a distributor support connected to the frame and the distribution manifold, and a drive mechanism connected to the distributor support, the distributor support interconnects the distribution manifold to the frame, the drive mechanism being movable to move the distribution manifold and fluid dispensers as a unit relative to the frame between raised and lowered positions.

14. The fluid dispensing assembly of claim 1 wherein the distribution manifold has only one manifold inlet in fluid connection with each distribution channel.

15. A wash station for washing a selected sample in a sample containing assembly, the wash station being connectable to a fluid line connected to a fluid source, comprising:

a frame;

a distribution manifold connected to the frame, the distribution manifold having a manifold inlet positioned to receive fluid from the fluid line, the distribution manifold having a plurality of distribution channels in fluid connection to the manifold inlet, the distribution channels each having flow control valve therein to allow fluid to flow in only one direction in the respective distribution channel, and each distribution channel having a separate channel outlet; and

an array of fluid dispensers connected to the distribution manifold, each fluid retaining member being connected to the channel outlet of a respective distribution channel to receive the fluid passing through the distribution channel, the fluid retaining members being adapted to dispense the fluid therefrom.

16. The wash station of claim 15 further including a gate valve connected to the distribution manifold and positioned to control fluid flow from the fluid source to the distribution source.

17. The wash station of claim 15 having a plurality of fluid lines and a plurality of fluid sources with fluids therein, the assembly further comprising a selector valve connectable to the fluid lines, the selector valve being adjustable to one of a plurality of positions to allow a selected one of the fluids to pass therethrough to the distribution manifold.

18. The wash station of claim 17 wherein the selector valve includes a body with a plurality of fluid inlets connectable to the fluid lines, a plurality of fluid passageways in the body communicating with the fluid inlets, a valve member connected to the body, and an outlet channel communicating with the valve member and the manifold inlet, the valve member having a valve channel therethrough that communicates with the outlet passageway, the valve member being adjustable to position the valve channel in communication with one of the fluid passageways to direct fluid from the one of the fluid passageways into the outlet passageway and into the manifold inlet and the valve member blocks the other fluid passageways to prevent fluid from flowing therethrough.

19. The wash station of claim 17 wherein the selector valve assembly has a gate valve in the outlet passageway, the gate valve being adjustable between open and closed positions to control the flow of fluid through the outlet passageway.

20. The wash station of claim 19 wherein the selector valve includes a valve control assembly that is connected to the valve member and that is adjustable to move the valve member to align the valve channel with the selected one of the fluid passageways.

21. The wash station of claim 17, further comprising a programmable controller coupled to the selector valve for controlling which fluid flows through the selector valve to the fluid passageways.

22. The wash station of claim 15 wherein each distribution channel has a check valve therein, each check valve being movable between an open position to allow the fluid to flow into the respective fluid retaining member and a closed position to block flow of the fluid in the distribution channel away from the respective fluid retaining member.

23. The wash station of claim 15 wherein the fluid dispensers are syringes.

24. The wash station of claim 15 wherein the distribution manifold and the fluid dispensers are movable as a unit vertically and laterally relative to the frame.

25. The wash station of claim 15 further comprising a plurality of distributor members connect to the fluid dispensers, each distributor member having an interior passageway, and a radially directed aperture in a distal end portion, the aperture communicating with the interior passageway to direct a flow of fluid radially away from the distal end portion.

26. The wash station of claim 15, further including a distributor support connected to the frame and the distribution manifold, and a drive mechanism connected to the distributor support, the distributor support and distribution manifold being movable as a unit by the drive mechanism relative to the frame.

27. The wash station of claim 26 further including an upper support member spaced apart from the distribution manifold, and a second drive mechanism interconnecting distribution manifold and the upper support member, the fluid dispensers extending between the distribution manifold and the upper support member, and the upper support member being movable by a second drive mechanism relative to the distribution manifold between first and second positions, the fluid dispensers being compressed and moved along a discharge stroke as the upper support member moves from the second position toward the first position, and the fluid dispensers are extended and moved along an aspirating stroke as the upper support member moves from the second position toward the first position.

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28. The wash station of claim 15 further including an upper support member spaced apart from the distribution manifold with the fluid dispensers movably extending between the distribution manifold and the upper support member, and a drive mechanism interconnecting the distribution manifold and the upper support member, the upper support member being movable by the drive mechanism relative to the distribution manifold between first and second positions, and the fluid dispensers each include a connector connected to the distribution manifold, a barrel attached to the connector and sized to receive the fluid from the distribution manifold, and a plunger with one end slidably positioned in the barrel and another end attached to the upper support member, the plunger moving axially within the barrel as the upper support member moves between the first and second positions.

29. The wash station of claim 28 wherein the connector has an outlet port and an inlet port, the inlet port connecting the barrel with the respective distribution channel of the distribution manifold, the plunger moves within the barrel away from the distribution manifold along an aspirating stroke to draw the fluid through the inlet port and into the barrel as the upper support member moves from the first position to the second position, and the plunger moves toward the distribution manifold along a dispensing stroke to dispense fluid through the outlet port into the distributor member.

30. The wash station of claim 29 wherein the connector has a valve in communication with the outlet port and positioned to prevent fluid or air from entering the barrel through the outlet port.

31. A wash station for washing a selected sample in a sample containing assembly, the wash station being connectable to fluid lines that connect to fluid sources comprising:

a frame; and

a fluid dispensing assembly connected to the frame, the fluid dispensing assembly having:

a selector valve connectable to the fluid lines to allow a selected fluid to pass therethrough;

an array of syringes coupled to the selector valve and positioned to receive the fluid passing therethrough, each syringe having a barrel and a plunger axially within the barrel;

a manifold connected to the barrels of the syringes and having a manifold inlet coupled to the selector valve and sized to receive the fluid passing through the selector valve, the manifold having a plurality of distribution channels coupled to the manifold inlet and in communication with the barrels of the syringes to direct the fluid into the barrels;

a support structure connected to the plungers and retaining the plungers in substantially axial alignment with the barrels, the support structure being movable with the plungers as a unit relative to the manifold with a portion of each the plunger moving axially within the barrel of a respective syringe; and

an array of distributor members coupled to the syringes to direct the fluid received from the syringe to the samples of the sample containing assembly.

32. The wash station of claim 31 wherein the manifold has a plurality of outlet apertures each in communication with a respective one of the distribution channels and in communication with a respective one of the syringes, each outlet aperture has a manifold valve therein that is movable between open and closed positions, each manifold valve allowing the fluid to flow through the outlet aperture and out of the respective distribution channel when in the open position and blocking the fluid from flowing through the outlet aperture when in the closed position.

33. The wash station of claim 31 wherein each distributor member has an interior passageway, a distal end, and a radially directed aperture in the distal end, the aperture communicating with the interior passageway to direct a flow of fluid radially away from the distal end.

34. The wash station of claim 31 wherein each syringe has a connector connected to the barrel and connected to the manifold, and each connector has an inlet port communicating with the respective distribution channel to receive the fluid from the distribution channel into the barrel.

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35. The wash station of claim 31 wherein each syringe has an outlet port that communicates with a respective one of the distributor members to direct the fluid from the barrel into the distributor member, and a valve member in the outlet port, the valve member being movable between open and closed positions, the valve member allowing fluid to flow out of the outlet port when in the open position, and the valve blocking fluid from flowing through the outlet port into the barrel when in the closed position.

36. The wash station of claim 35 wherein each connector has a biasing member connected to the valve member, the biasing member biasing the valve member toward the closed position.

37. The wash station of claim 31 wherein the selector valve includes a body with a plurality of fluid inlets connectable to the fluid lines, a plurality of fluid passageways in the body communicating with the fluid inlets, a valve member connected to the body, and an outlet channel communicating with from the valve member and the manifold inlet, the valve member having a valve channel therethrough that communicates with the outlet passageway, the valve member being adjustable to position the valve channel in communication with one of the fluid passageways to direct fluid from the one of the fluid passageways into the outlet passageway and into the manifold inlet and the valve member blocks the other fluid passageways to prevent fluid from flowing therethrough.

38. The wash station of claim 37, further comprising a programmable controller connected to the valve control assembly for controlling adjustment of the valve member relative to the fluid passageways.

39. The wash station of claim 31, further comprising a programmable controller, and the selector valve has a control mechanism operatively connected to the controller for automatic adjustment of the valve member relative to the fluid passageways.

40. A wash station assembly, comprising:  
a plurality of fluid sources with selected fluids therein;



a plurality of fluid lines each connected to a respective one of the fluid sources;  
controller operatively connected to the fluid sources;

a wash station connected to the fluid lines and operatively connected to the controller, the wash station including a frame and a fluid dispensing assembly connected to the frame, the fluid dispensing assembly having:

a selector valve connectable to the fluid lines and operatively connected to the controller, the selector valve being adjustable to a selected one of a plurality of positions to allow a selected one of the fluids to pass therethrough, the selector valve having a position sensor that senses the position of the selector valve relative to the fluid lines, and the position sensor communicates with the controller as to the position of the selector valve;

an array of fluid retaining members coupled to the selector valve and positioned to receive the fluid passing through the selector valve and to dispense the fluid therefrom;

a manifold having a manifold inlet coupled to the selector valve and sized to receive the fluid passing through the selector valve, the manifold being coupled to the fluid retaining members to direct the fluid into the fluid retaining members; and

an array of distributor members each coupled to a respective one of the fluid retaining members, each distributor members positioned to receive the fluid from the fluid retaining member, and the distributor members being positionable relative to the sample containing assembly to direct the fluid to the sample; and

a waste management system connected to the wash station, the waste management system having first and second waste receptacles, a drain line coupled to the first and second receptacles and to the wash station to receive waste fluid from the wash station, a flow control member connected to a drain line between the wash station and the first and second waste receptacles, the flow control member being adjustable to selectively control a flow of waste fluid to a selected one of the first and second waste receptacles.

41. The wash station assembly of claim 40 wherein the selector valve includes a body with a plurality of fluid inlets connectable to the fluid lines, a plurality of fluid passageways in the body communicating with the fluid inlets, a valve member connected to the body, and an outlet channel communicating from the valve member and the manifold, the valve member having a valve channel therethrough that communicates with the outlet passageway,

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the valve member being adjustable to position the valve channel in communication with one of the fluid passageways to direct fluid from the one of the fluid passageways into the outlet passageway and to the manifold and the valve member blocks the other fluid passageways to prevent fluid from flowing therethrough.

42. The wash station assembly of claim 41 wherein the selector valve assembly includes a valve control mechanism operatively connected to the controller and connected to the valve member, the valve control mechanism being adjustable to move the valve member to a selected position to receive a selected one of the fluids.

43. The wash station assembly of claim 41 wherein the fluid retaining members are syringes each having a barrel and a plunger movably positioned in the barrel, the wash station includes a support plate connected to the plungers to retain the plungers in axial alignment with the barrels, and the manifold is connected to the barrels of the syringes, the support plate being movable with the plungers as a unit relative to the manifold and barrels to cause axial movement of the plungers within each respective barrel, the manifold having a manifold inlet in communication with the selector valve, the distributor plate having a plurality of distribution channels coupled to the manifold inlet and arranged to direct the fluid into the barrels.

44. The wash station assembly of claim 41, further comprising a fluid level sensing system connected to the at least one of the fluid sources.

45. The wash station assembly of claim 44 wherein the fluid level sensing system includes a plurality of switches and a switch-activating float that is movable relative to the switches as a fluid level in the fluid source changes.

46. The wash station assembly of claim 45 wherein the switches are reed switches, and the switch-activating float is a magnetic float that energizes each reed switch as the magnetic float moves past each reed switch.

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47. The wash station assembly of claim 45 wherein the fluid level sensing system includes a resistance ladder with a plurality of resistors coupled to the switches.

48. The wash station assembly of claim 47 wherein the fluid level sensing system further includes a coding resistor connected to the sensor ladder and coupled to the controller.

49. The wash station assembly of claim 44 wherein the fluid level sensing system is operatively coupled to controller.

50. A method of washing a sample with a selected fluid distributed by a wash station, the method comprising:

passing a plurality of fluids through separate fluid lines to a selector valve of a wash station, the selector valve being adjustable to allow a selected one of the fluids to pass therethrough with the other fluids being blocked from passing therethrough;

adjusting the selector valve to allow the selected one of the fluids to flow therethrough to a distributor manifold;

substantially simultaneously distributing with the distributor manifold a selected amount of the selected fluid into a plurality of fluid distributing assemblies;

substantially simultaneously dispensing the fluid from the fluid distributing assemblies into a plurality of sample containers; and

washing samples in the sample containers with the fluid dispensed into the sample containers.

51. The method of claim 50, further comprising:

determining if the fluid is a halogenated or non-halogenated fluid;

removing the fluid from the sample containers;

directing the fluid removed from the sample container into a waste line coupled to a first fluid receptacle for the halogenated fluid and a second fluid receptacle for the non-halogenated fluid;

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switching a flow control member in the waste line to a first selected position when the fluid is a halogenated fluid and to a second position when the fluid is a non-halogenated fluid; and

directing with the flow control member the fluid into the first fluid receptacle when the fluid is a halogenated fluid and into the second fluid receptacle when the fluid is a non-halogenated fluid.

52. The method of claim 50, further comprising:

adjusting the selector valve from a first position to a second position to allow a second one of the fluids to pass through the selector valve, with the first one of the fluids and the other ones of the fluids being blocked from passing through the selector valve;

distributing with the distributor manifold the second fluid into the fluid distributing assemblies; and

substantially simultaneously dispensing the second fluid from the fluid distributing assemblies into a plurality of the sample containers.

53. The method of claim 52, further comprising:

determining if the second fluid is a halogenated fluid or non-halogenated fluid;

removing the second fluid from the sample containers;

directing the second fluid removed from the sample containers into a waste line coupled to a first fluid receptacle and a second fluid receptacle for non-halogenated fluids;

switching a flow control member in the waste line to a first position when the second fluid is a halogenated fluid and a second position when the second fluid is a non-halogenated fluid; and

directing with the flow control member the second fluid through the flow and into the first fluid receptacle when the second fluid is a halogenated fluid and into the second fluid receptacle when the second fluid is a non-halogenated fluid.

54. The method of claim 50, further comprising detecting a level of fluid in a fluid source that is connected to at least one of the fluid lines.

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55. The method of claim 54 wherein detecting the level of fluid includes measuring a resistance of a sensor system having a resistance ladder, a plurality of switches connected to the resistance ladder, and a switch activating float that moves with the level of the fluid past the switches and energizes the switches to change the resistance in the resistance ladder.

56. A method of washing a sample with a selected fluid distributed by a wash station, the method comprising:

passing a selected fluids through a fluid line to a distributor manifold;

substantially uniformly distributing the selected fluid into a plurality of distribution channels in the distributor manifold with the fluid flowing in one direction in the distribution channels;

blocking the fluid from flowing in an opposite direction in the distribution channels, the fluid being blocked by a valve in each distribution channel;

substantially simultaneously distributing with the distributor manifold a selected amount of the selected fluid into a plurality of fluid dispensers; and

substantially simultaneously dispensing the fluid from the fluid dispensers into a plurality of sample containers.